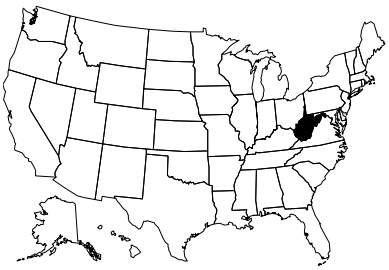
WEST VIRGINIA



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Program Description

The West Virginia Department of Environmental Protection (WV DEP) implemented the Watershed Assessment Program in 1996. This program was designed to systematically measure the water quality and biological health of the state's rivers and streams. The program has four major components: 1) Random or Probabilistic Sampling; 2) Pre-TMDL sampling; 3) Ambient WQ Monitoring; and 4) "Regular Assessments."

Benthic macroinvertebrates are collected at the "random sites," regular WAP (Watershed Assessment Program) sites, and selected Pre-TMDL sites. The program utilizes a rectangular dip net, compositing samples from two square meters and identifying a 200 organism sub-sample. WV DEP identified the "bugs" in-house to family level the first three years of the program. In 1999, WV DEP contracted out the identification work and switched to genus level identification. In 2000, a macroinvertebrate index was developed for West Virginia with support from EPA's biocriteria development program. This index provides a means to establish an impairment threshold that is based on a set of minimally disturbed reference sites.

The "Regular Assessments" were the majority of WV DEP's workload in the program's first year and continue to be a major portion of efforts. These consisted of sampling as many streams as possible (considering personnel limitations) in watersheds that were scheduled for assessment according to a 5 year cycle (5-7 watersheds per year). These assessments included the collection of water quality, habitat and macroinvertebrate data. All streams previously listed as impaired were targeted for assessment, as were a portion of all "unassessed" and "partially impaired" streams.

In 1997, the Watershed Assessment Program added a probabilistic sampling component. The first 5-year cycle was completed in 2001. The first cycle consisted of sampling 30-35 sites in each of the major watersheds (8-digit HUCs) in the state, sampling all sites in a watershed in a single year. The next 5 year cycle begins in 2002 and will have a different sampling strategy. The same effort, 150 sites, will be spread across the state each year instead of just the 5-7 watersheds being assessed that year. This will allow a summary of the condition of the state's streams to be completed every year instead of having to wait for the end of the 5-year cycle. This strategy also eliminates the problem of comparing watersheds sampled in different years that may have had drastically different climactic conditions (i.e. drought versus flood).

Periphyton will be collected at all of the random sites starting in 2002. The results of these collections will hopefully aid in the development of nutrient criteria. Streams with known eutrification problems and some of WV DEP's established reference sites may be sampled as well.

The Division of Natural Resources (DNR) is the fish and game agency of West Virginia. As part of its duties, statewide fishery surveys are conducted annually to monitor game and nongame fish populations. These surveys are not probability based as they are usually performed on target streams with ongoing programs (e.g., stockings) or due to crisis management reasons. The WV DNR has no regulatory authority relative to the state's water quality standards, but we are sometimes involved in a fish advisory capacity. The WV DNR is developing a fish Index of Biotic Integrity via a cooperative agreement with the USEPA. The IBI is being developed somewhat independently from the WQS that are utilized by WV DEP. Someday it may be used in the 305(b) program by a collaboration of agencies.

Documentation and Further Information

WV DEP Division of Water Resources list of publications, including direct links to *West Virginia Water Quality Status Assessment 305(b) Report 2000* and other 305(b) reports, multiple 303(d) listings, *West Virginia's Monitoring Strategy*, and *A Stream Condition Index for West Virginia Wadeable Streams*, 2000: http://www.dep.state.wv.us/item.cfm?ssid=11&ss1id=192

Smithson, J. 2001. Watershed assessment program. SOP. WV DEP Division of Water Resources.

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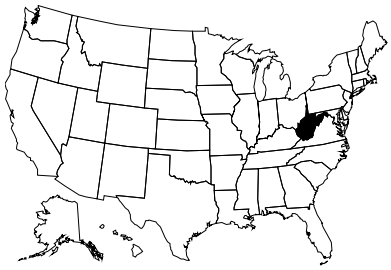

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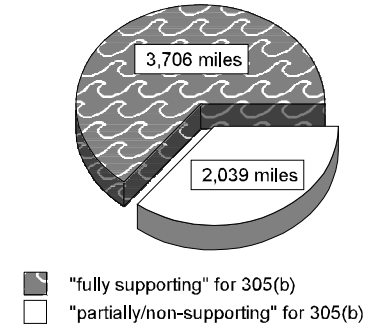
Programmatic Elements

Uses of bioassessment within overall water quality program	✓	problem identification (screening)
	✓	nonpoint source assessments
	✓	monitoring the effectiveness of BMPs
	✓	ALU determinations/ambient monitoring
		promulgated into state water quality standards as biocriteria
	✓	support of antidegradation
	✓	evaluation of discharge permit conditions
	✓	TMDL assessment and monitoring
		other:
Applicable monitoring designs	✓	targeted (i.e., sites selected for specific purpose) *(comprehensive use throughout jurisdiction)*
	✓	fixed station (i.e., water quality monitoring stations) *(comprehensive use throughout jurisdiction)*
		probabilistic by stream order/catchment area
	✓	probabilistic by ecoregion, or statewide *(comprehensive use throughout jurisdiction)*
	✓	rotating basin *(comprehensive use throughout jurisdiction)*
		other:

Stream Miles

Total miles *(determined using RF3 augmented with all named streams on 1:24,000 topographic map)*	**32,278**
Total perennial miles	21,114
Total miles assessed for biology	**5,745**
fully supporting for 305(b)	3,706
partially/non-supporting for 305(b)	2,039
listed for 303(d)	1,315
number of sites sampled	60-90
number of miles assessed per site	–

5,745 Miles Assessed for Biology



Aquatic Life Use (ALU) Designations and Decision-Making

ALU designation basis	Single Aquatic Life Use	
ALU designations in state water quality standards	Two designations: warmwater and coldwater	
Narrative Biocriteria in WQS	none - Internal program procedures used to support general aquatic life standard	
Numeric Biocriteria in WQS	none	
Uses of bioassessment data in integrated assessments with other environmental data (e.g., toxicity testing and chemical specific criteria)	✓	assessment of aquatic resources
	✓	cause and effect determinations
	✓	permitted discharges
	✓	monitoring (e.g., improvements after mitigation)
	✓	watershed based management
Uses of bioassessment/ biocriteria in making management decisions regarding restoration of aquatic resources to a designated ALU	Watershed restoration action strategies as part of the 319 grant program.	

Reference Site/Condition Development

Number of reference sites	**~105 total**	
Reference site determinations		site-specific
		paired watersheds
	✓	regional (aggregate of sites)
	✓	professional judgment
		other:
Reference site criteria	The following selection criteria are used to select reference sites: (* Indicates criterion that can be determined in the field.) 1. D.O. > 5.0mg/l* 2. pH between 6.0 and 9.0* 3. Conductivity < 500 µS /cm* 4. Fecal coliform < 800 colony/100ml 5. No violations of State WQ Standards 6. No obvious sources of nonpoint pollution* 7. Epifaunal substrate / available cover score >10* 8. Channel alteration score >10* 9. Sediment deposition score >10 * 10. Bank vegetative protection score >5* 11. Undisturbed vegetation zone width score >5* 12. Total habitat score > or = 130 points* 13. Evaluation of anthropogenic activities and disturbances* 14. No known point source discharges upstream and within view of assessment site (completed after 1-13 are met)	
Characterization of reference sites within a regional context		historical conditions
		least disturbed sites
		gradient response
		professional judgment
	✓	other: minimally disturbed**
Stream stratification within a regional reference conditions		ecoregions (or some aggregate)
		elevation
		stream type
		multivariate grouping
	✓	jurisdictional (i.e., statewide)
		other:
Additional information		reference sites linked to ALU
		reference sites/condition referenced in water quality standards
	✓	some reference sites represent acceptable human-induced conditions *(minimal)*

**WV reference sites are best described as *minimally disturbed* sites. They have to meet each of the 14 criteria mentioned above; thus there are some areas with no sites that WV DEP is comfortable calling reference.

Field and Lab Methods

Assemblages assessed	✓	benthos *(>500 samples/year, single season, multiple sites - watershed level)*
	✓	fish* *(<100 samples/year; single observation, limited sampling)*
		periphyton
		other:
Benthos		
sampling gear		D-frame, dipnet, collect by hand; 500-600 micron mesh
habitat selection		riffle/run (cobble)
subsample size		200 count
taxonomy		family, genus
Fish*		
sampling gear		seine, backpack and boat electrofishers, electric seine; 1/8" and 3/16" mesh
habitat selection		multihabitat
sample processing		length measurement, biomass - individual
subsample		none
taxonomy		species
Habitat assessments		visual based, quantitative measurements, riffle stability index; performed with bioassessments
Quality assurance program elements		standard operating procedures, quality assurance plan, periodic meetings, training for biologists, sorting proficiency checks, sorting and taxonomic proficiency checks, specimen archival

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Data Analysis and Interpretation

Data analysis tools and methods	✓	summary tables, illustrative graphs
		parametric ANOVAs
		multivariate analysis
	✓	biological metrics *(aggregate metrics into an index)*
		disturbance gradients
		other:
Multimetric thresholds		
transforming metrics into unitless scores		95th percentile of total population
defining impairment in a multimetric index		5th percentile of reference sites
Evaluation of performance characteristics*	✓	repeat sampling
	✓	precision
	✓	sensitivity
	✓	bias
	✓	accuracy
Biological data		
Storage		WAPBAS (similar to EDAS)
Retrieval and analysis		WAPBAS (similar to EDAS)

*Described in *A Stream Condition Index for West Virginia Wadeable Streams* (see documentation and further information)